INSTRUCTION MANUAL

SD1012

TRACKING FILTER

F. T. MAINT. LAB

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SPECTRAL DYNAMICS CORPORATION OF SAN DIEGO

SERIAL NUMBER 217

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SPECTRAL DYNAMICS CORPORATION OF SAN DIEGO

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1 June 1965
Revised
May 1966

SD 1012

INTER-OFFICE MEMO

SPECTRAL DYNAMICS CORPORATION OF SAN DIEGO

Cane-Topp SM 6-5750

MEMO TO: Con Topp
Cane-Jessup Company

DATE: May 1, 1967

FROM : W. M. Hawkins, Jr.

SUBJECT : Boeing

Dear Con:

This is to answer your memo of April 25th regarding calibration and test procedures on some of our gear.

According to Pete Gillies, there is no substitute for either an SD101, 101A, or SD1010 when checking out an SD1012. One of these three is essential.

Also, according to Pete, the SD104 should be checked every 90 days or so to see that it still meets specs. IT SHOULD NOT be "calibrated" using the procedure in the book unless (a) the technician is very familiar with the unit, and (b) a very definite problem has been noted. To routinely "calibrate" the unit is asking for real trouble. And if they have trouble, they should call us on their hot line.

Best regards,

FILTERED OUTPUT
CHANNEL 1
FILTER IN OUT
OVERLOAD
DC OUTPUT
VOLTS RANGE (RMS)
1.0 5
0.5 10
0.1 CAL
FILTER CAL
SIGNAL INPUT
GND
PHASE ADJ
CALIBRATED RELATIVE
GAIN
SPECTRAL DYNAMICS CORPORATION
OF SAN DIEGO
MODEL SD1012 TRACKING FILTER
POWER
OFF STBY ON
CHANNEL 2
FILTERED OUTPUT
FILTER IN OUT
OVERLOAD
DC OUTPUT
VOLTS RANGE (RMS)
1.0 5
0.5 10
0.1 CAL
FILTER CAL
SIGNAL INPUT
GND
PHASE ADJ
CALIBRATED RELATIVE
GAIN

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UNPACKING

The Model SD-1012 Tracking Filter is shipped fully assembled in a polystyrene carton which protects the instrument against all normal shipping hazards. To determine possible damage during shipment of the instrument, the procedures given below should be followed:

a. Place the carton upright on the floor and inspect the exterior, making note of any visible damage.

b. Remove and retain all forms and invoices attached to the carton by the carrier.

c. Unseal the top portion of the carton and remove.

d. Lift the instrument out of the carton and place it on a work bench or other flat surface.

e. Inspect the exterior of the instrument carefully, noting all visible damage.

f. The instrument may now be checked for functional operation by following the procedure outlined in section II.

CLAIM FOR DAMAGE IN SHIPMENT

The instrument should be tested as soon as it is received. It it fails to operate properly, or is damaged in any way, a claim should be filed with the carrier. A full report of the damage should be obtained by the claims agent, and this report should be forwarded to Spectral Dynamics Corporation of San Diego. The buyer will be advised of the disposition to be made of the equipment and arrangements will be made for repair or replacement. Include Model Number and Serial Number when referring to this instrument for any reason.

WARRANTY

Spectral Dynamics Corporation of San Diego warrants each instrument manufactured by them to be free from defects in material and workmanship for one year after delivery to the original purchaser. Our liability under this warranty is limited to servicing and adjusting the instrument returned to the factory with transportation charges prepaid by the purchaser. This warranty specifically excludes any liability in regard to electron tubes, batteries, fuses and lamps. If the malfunction or a portion thereof is determined by Spectral Dynamics Corporation of San Diego to have been caused by misuse or abnormal conditions of operation, an estimate will be submitted to the purchaser prior to commencing repairs.

If any fault develops, the following steps should be taken:

a. Notify Spectral Dynamics Corporation of San Diego, giving full details of the problem, including model and serial number of the equipment. Upon receipt of this information, service data or shipping instructions will be forwarded.

b. On receipt of shipping instructions, forward the instrument prepaid, to the factory or authorized repair station indicated on the instructions.

SHIPPING

All shipments to the factory should be made via Air Express. The instrument should be replaced in its original shipping carton or in a strong exterior container surrounded by two or three inches of excelsior or similar shock-absorbing material.

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SECTION I

GENERAL INFORMATION

1-1 INTRODUCTION

The SD-1012 Tracking Filter is a newly developed multi-purpose instrument offering exceptional application versatility in the fields of vibration, acoustical and electrical analysis and measurement. Essentially, the instrument is a two-channel, frequency-tuned bandpass filter without depending upon an internal servo or frequency to DC conversion for its unique operation (figure 1). The center frequency of each channel is continuously and precisely tuned to track a frequency from an external source.

The SD-1012 requires an externally supplied carrier source. Either the SD-1010, SD-101, SD-101 Mark II or the SD-101A is used to supply this external carrier signal. The SD-1010 is an upper sideband signal generator from which is obtained an output frequency that is the sum of an externally applied signal in the frequency range of 1 CPS to 30 KC and a 100 KC reference oscillator frequency. As an example, when applying an input of 2000 CPS to the input of the SD-1010 an output frequency of 102,000 CPS will be obtained at its output. The SD-101 models are independent single channel tracking filter units and thus internally contain an upper sideband signal generator. The output of this generator is available from a connector on the SD-101 models and can provide sufficient power to drive up to 32 channels of the SD-1012 Tracking Filter.

The simplified block diagram shown in figure 2 illustrates the operation of this instrument. The signals to be analyzed or filtered (F_{s1} and F_{s2}) are applied to the signal inputs. An upper sideband carrier signal derived in either the SD-101 models or the SD-1010 ($F_t + F_r$) is used to drive the balanced modulator, where F_t is the frequency to which the system is tuned and F_r is the reference (100 KC) oscillator.

The output of each balanced modulator is then the sum and difference frequencies produced by the modulation process. F_r is adjusted to be equal in frequency to the center frequency of the bandpass crystal filter. Therefore, when F_s contains a signal that is equal in frequency to F_t, the difference frequency produced results in a frequency equal to F_r which is equal to the center frequency of the filter. The bandpass crystal filter has a finite selected bandwidth and very rapid attenuation outside the pass band; thus, the only signal that is passed by the filter is the difference-frequency equal or nearly equal (within the bandwidth) to F_r. The amplitude of this signal is proportional to the amplitude of the input signal. The filtered difference-frequency is then provided to demodulator and DC conversion circuitry.

The DC output is available at terminals on the front and rear panels for recorder and other applications. The filtered difference-frequency signal is demodulated with the upper

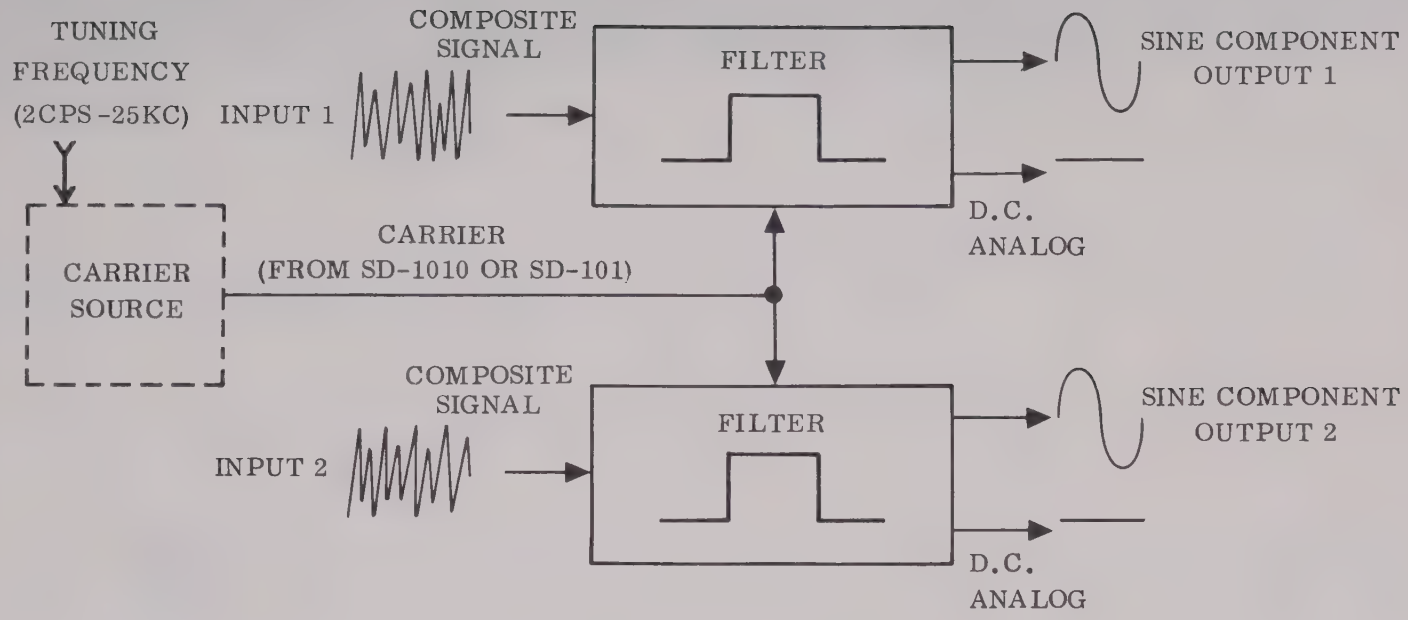

Figure 1. Concept of Operation

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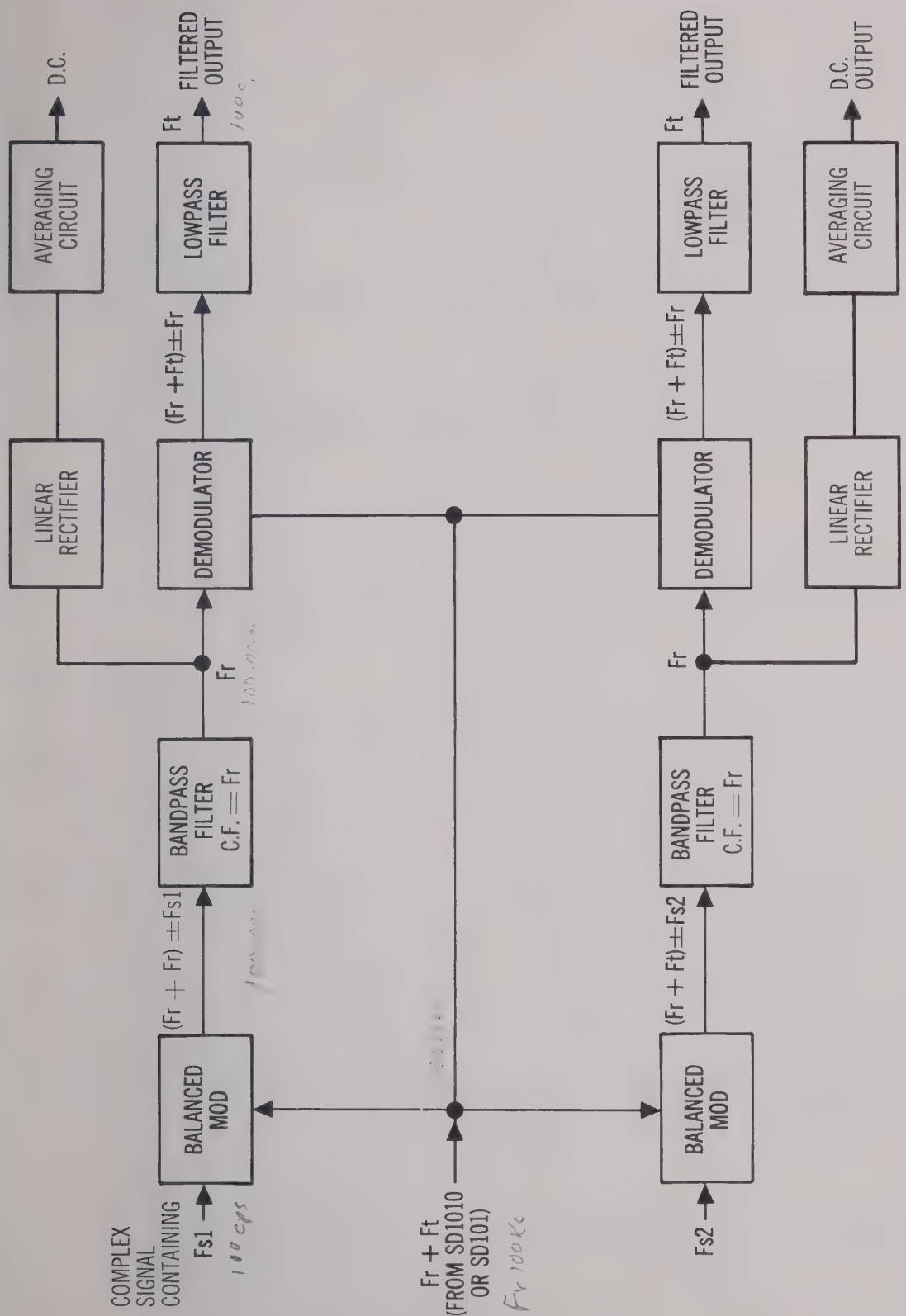


Figure 2. Simplified Block Diagram

nd carrier to provide a filtered output signal which is equal to the input fre- and proportional in amplitude.

)1012 contains an internal calibration circuit, thus eliminating the need for al equipment to perform the function of routine calibration and set up. The nd output jacks on the front panel are paralleled with connectors on the rear equipment for rack-mounted installations. Accommodations for plug-in rystal filters are provided to minimize the effort required when changing uipment from one application to another.

ENERAL DESCRIPTION

strument is packaged on a 7IN. x 19 IN. standard panel and a chassis that s 14 IN. behind the front panel. The bottom cover is perforated for venti- and is easily removed for maintenance.

ont panel contains the necessary operating controls, calibration controls put-output jacks to perform the routine calibrating and operating functions. llowing is a list of the front panel items and a brief description of their ns. Refer to figure 3 for their various locations.

Switch (S3)

TBY position applies power to the power supply, the tube filaments and to ens for the crystal filters. The amber light above the power switch denotes ndby position. The ON position of the power switch applies plate voltage tubes, and is denoted by a green light.

Input (J2/J13)

gnal that is to be analyzed or filtered is applied to these terminals. This s paralleled to a BNC connector on the rear of the equipment for use in nounted applications.

ad Indicator Lamps (I3/I4)

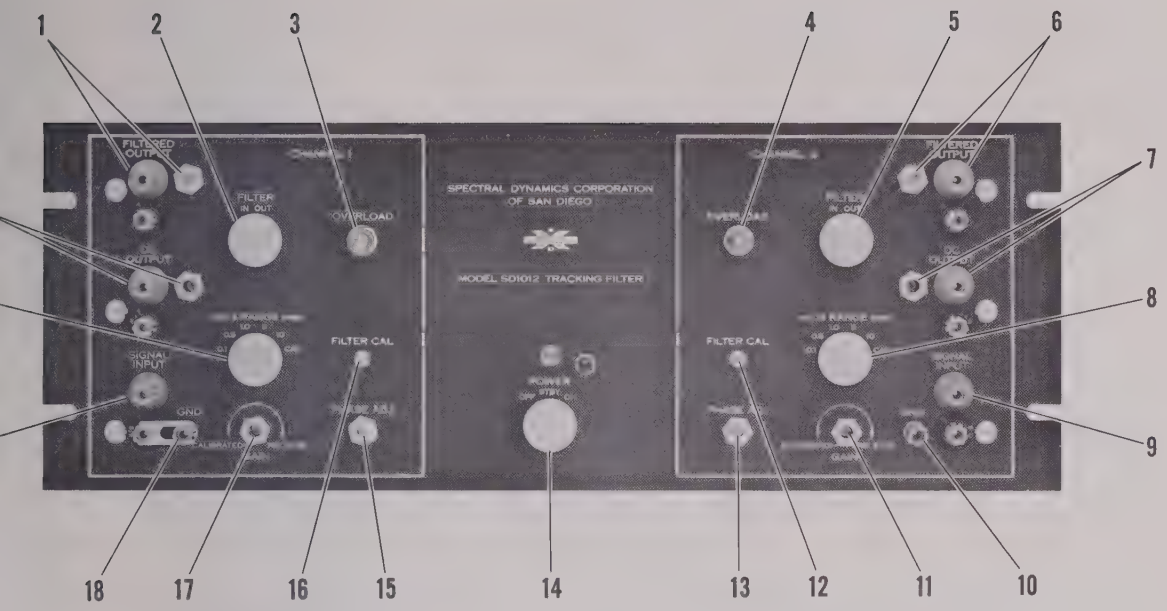
indicator lights inform the operator when a circuit overload condition exists. are normally adjusted to operate with crest factors (peak/RMS) of approxi- y 4 to 1 when operating with the RMS input level indicated on the Range or.

Selector (S2/S5)

switch provides either the filtered signal or the composite input signal at the ERED OUTPUT terminals. The filtered signal level is adjusted for unity n gain with the RANGE selector at 10 volts (RMS). With the FILTER SELECTOR OUT position, the unit is completely bypassed. Thus, unity gain of the com- input signal is always maintained.

ER CAL Adjustments (R45/R112)

potentiometers allow the operator to establish the correct overall gain through channel by normalizing the insertion loss of each crystal bandpass filter.



1 FILTERED OUTPUT/ADJUSTMENT (J6/R56)
2 FILTER SELECTOR (S2)
3 OVERLOAD LAMP (I3)
4 OVERLOAD LAMP (I4)
5 FILTER SELECTOR (S5)
6 FILTERED OUTPUT/ADJUSTMENT (J17/R131)
7 DC OUTPUT/RECORDER ADJUST (J15/R126)
8 RANGE SWITCH (S4)
9 SIGNAL INPUT (J13)
10 CHASSIS GROUND
11 GAIN/CALIBRATED CONTROL (R86/S10)
12 FILTER CALIBRATION (R112)
13 PHASE ADJUSTMENT (R94)
14 POWER SWITCH (S3)
15 PHASE ADJUSTMENT (R34)
16 FILTER CALIBRATION (R45)
17 GAIN/CALIBRATED CONTROL (R20/S9)
18 CHASSIS GROUND
19 SIGNAL INPUT (J2)
20 RANGE SWITCH (S1)
21 DC OUTPUT/RECORDER ADJUST (J8/R65)

Figure 3. Front Panel

ge Switches (S1/S4)

range switches are calibrated in volts (RMS) and operate the attenuators on inputs of the instrument. The RMS level of the incoming signal should not eed the selected range. In the CAL position, a calibration signal is applied rnally to the instrument.

n/Calibrated Controls (R20/S9 & R86/S10)

se controls allow the operator to fix the gain of each input amplifier at X100 ntrol fully counter-clockwise to CALIBRATED detent position) or to vary the h over an 18db range for relative measurements.

ered Outputs (J6/J17)

filtered signal output is the demodulated output derived from modulating the rier sideband with the filtered frequency from the crystal filter and passing resultant beat frequency through a 30 KC low pass filter and an output ampli-.

Outputs/Recorder Adjust (J8/R65 & J15/R126)

DC voltage proportional to the amplitude of the signal being analyzed is avail-e at these terminals. The DC Recorder level is adjustable by use of the screw-ver adjustment adjacent to the terminals.

se Adjustments (R34/R94)

se front panel controls permit the operator to normalize the relative phase of filtered output signals.

FIGURE 4 FOR FOLLOWING ITEMS LOCATED ON REAR OF THE CHASSIS

rrier Sideband Input (J3/J11)

shown in figure 4, the carrier sideband inputs for each channel are located on rear of the chassis via BNC type connectors

se (F1)

fuse is a two amp slow-blow type 3AG standard fuse.

wer Input Receptacle (J9)

power input receptacle is a standard recessed male connector for a three con-tor line cord.

ut and Output Connectors

R-type connectors for the Signal Inputs (J1/J12), DC Outputs (J7/J14), and tered Outputs (J5/J16) are mounted on separate brackets on the rear of each w Frequency Assembly and are in parallel with corresponding functions on the nt panel.

ration Relay Power Input (J4)

connector is wired in parallel with the calibration relays. When connected imilar connector on the Carrier Sideband Generator (when so provided), they t total system calibration simultaneously when the MASTER CAL switch on rrier generator is operated.

Heater Switch (S6)

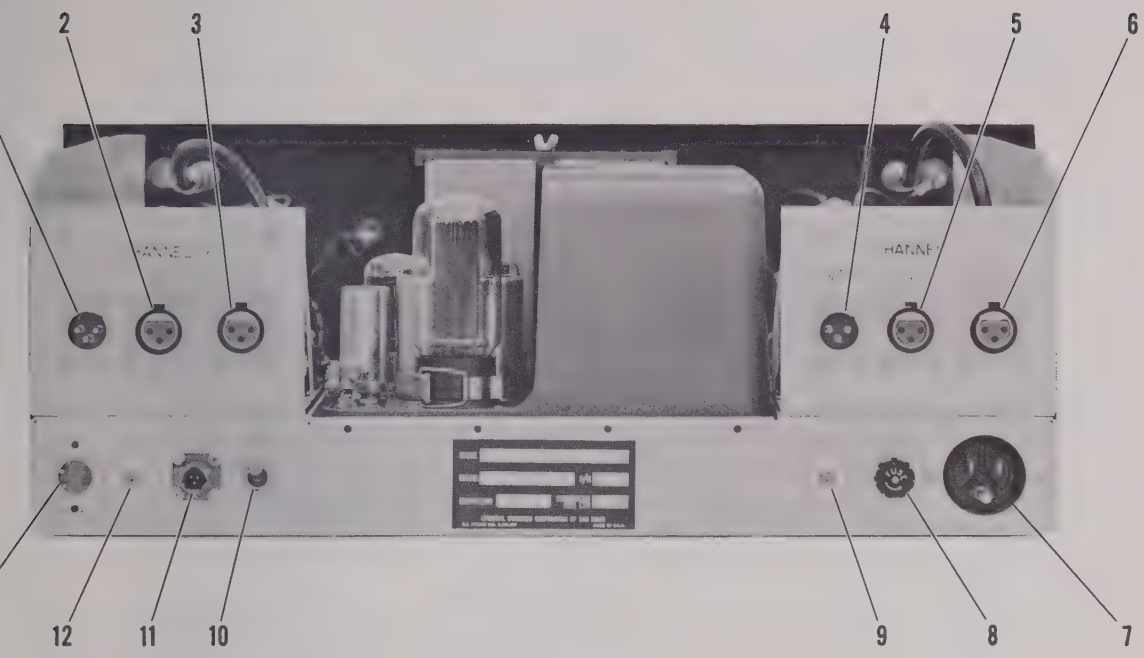
switch permits the operator to remove the crystal filter AC heater voltage. is to permit all filters to be operated at ambient temperature when a number cking filters are to be used in a single system. A greater degree of short phase stability is obtainable in this manner.

DC Input (J20)

connector receives 28 volts DC power used for heating the optional Model PC proportional control crystal bandpass filters. Note: Observe polarity; is positive and pin 2 is negative. Pin 2 is internally connected to circuit nd. If the SD1012 is to be operated in the "floating" mode (front-panel jumper nd strap open), the dc power source connected to J20 must also be "floating".

SPECIFICATIONS

Frequency Range: (Tuning frequency applied to SD1010, SD101, SD101 Mark II or SD101A)	2 CPS - 25 KC in one range
Useful Frequency Range:	1 CPS - 30 KC
Dynamic Range:	60 DB for filtered signal output, 40 DB for DC output
Input Impedance:	1 megohm, single-ended input floating; chassis grounding by front panel buss bar connection
Sensitivity:	Five selectable ranges of 0.1, 0.5, 1, 5 and 10 volts (RMS) maximum input
Overload Indication:	Front panel overload lamps
Linearity:	Filtered output signal, plus or minus 0.5 DB; DC output, plus or minus 0.5 DB
Selectivity:	Accommodations provided for plug-in type crystal filters. The filter bandwidth to be specified by the customer, and prices quoted accordingly. Standard bandwidths available are 2.0, 5, 10, 20, 50 and 100 CPS. The shape factor (60DB/3DB bandwidth) of each filter is nominally 4/1.



1 SIGNAL INPUT (J12)
2 DC OUTPUT (J14)
3 FILTERED OUTPUT (J16)
4 SIGNAL INPUT (J1)
5 DC OUTPUT (J7)
6 FILTERED OUTPUT (J5)
7 POWER INPUT (J9)
8 FUSE (F1)
9 CARRIER SIDEBAND INPUT (J3)
10 FILTERS HEATER SWITCH (S6)
11 CAL RELAY POWER INPUT (J4)
12 CARRIER SIDEBAND INPUT (J11)
13 DC INPUT FOR APC FILTERS (J20)

Figure 4. Rear View

Filter Out:	A front panel control will bypass the filter circuit and route the unfiltered input signals to the output terminals at unity gain.
Calibration:	Internal zener reference.
Phase:	Phase coherent output signals. A phase adjustment is provided to phase normalize the outputs.
Phase Accuracy:	Plus or minus 5 degrees between channels.
Power:	105 - 125 VAC, 50/60/400 CPS; 120 watts approx., 230 VAC available by special order.
Size:	Standard rack panel: 7 IN. x 19 IN. Depth behind panel: 14 IN. Shipping weight: 37 LB.
Outputs:	Filtered signal: Adjustable for 10 volts (RMS) max. into 10K load; DC output: Adjustable for 1 volt DC into 100K load.
Input/Output Availability:	XLR-type input and output connectors on the rear of the unit in parallel with front panel jacks.
Output Impedance:	Filtered signal: Less than 600 ohms

SECTION II

OPERATING INSTRUCTIONS

ROUTINE OPERATING PROCEDURE

Install desired plug-in crystal bandpass filters in octal sockets A1 and A2.

Note: Two types of plug-in crystal bandpass filters are available for use in the SD-1012. Filter type SD100A uses internally connected 115 volts AC line power for oven heating. Type SD100APC uses 28 volts DC power supplied from an external source to rear chassis connector J20. Both types may be used interchangeably in either socket.

If one or two Model SD100APC filters are to be used, connect a suitable DC power supply to rear chassis connector J20. Each filter requires approximately 750 milliamps at 28 volts DC when power is first applied. The current requirement decreases as the filters warm up. Voltage regulation of plus or minus 0.5%, or better, is required for best filter performance.

Turn POWER switch to STBY and allow equipment to warm up for approxiy 45 minutes.

Connect the CARRIER OUTPUT of the SD-101, SD-101 Mark II, SD-101A or 010 to the CARRIER SIDEBAND INPUTS on the rear of the SD-1012.

Turn the POWER switch to ON, FILTER switches to the IN positions, RANGE hes to CAL and the carrier generator MASTER CAL switch to ON. Make sure elay power cable is connected between the SD-1010 and SD-1012. If using 01, SD-101 Mark II, or SD-101A as carrier source, place all range switches AL position.

Turn both FILTERED OUTPUT controls fully clockwise. Turn both GAIN ols fully counter-clockwise to the CALIBRATED (detent) positions.

While monitoring the output at the FILTERED SIGNAL terminals, rotate the ency adjustment on the carrier generator until a maximum voltage level is ned. This level should be seven volts (RMS), if not, check the equipment ration, paragraph 3-4.

Return the equipment to the operating mode (SD-1012 RANGE switches to opriate range, SD-101, SD-101 Mark II or SD-101A RANGE switches to any e other than CAL).

Connect a tuning signal source to the input of the carrier generator.

Connect the signal to be filtered to the signal input of the SD-1012. It should oted that the equipment is designed to accommodate crest factors of approxily 4/1, with the maximum RMS voltage input specified by the range switch ng. Do not exceed this voltage.

The equipment is ready for operation.

Note: With a full scale input signal applied in any RANGE position, the FILTERED OUTPUT signal level is adjustable over a range of 0 - 10 volts (RMS) using the FILTERED OUTPUT control, and the DC OUTPUT level may be varied between 0 and 1 volt using the DC OUTPUT control.

It is often desirable to operate the SD-1012 as a "unity gain" device, where signals applied to the SIGNAL INPUT terminals are displayed at the FILTERED OUTPUT terminals at unity gain (X1). The SD-1012 channels may be easily and quickly adjusted for unity gain:

1. Perform steps a. thru f. above.

2. Set SD-1012 RANGE switch to the position that will be used during routine operation.

3. Using a common signal generator (with external attenuator if required), apply a 1 volt (RMS), 100 cps signal to the TUNING INPUT of the carrier generator, and a "full scale" signal to the SD-1012 SIGNAL INPUT terminal for the desired channel.

4. Turn the FILTER switch to OUT and note the amplitude of the FILTERED OUTPUT signal.

5. Turn the FILTER switch to IN and adjust the FILTERED OUTPUT control for the same filtered output signal amplitude noted in step 4.

6. The channel is now adjusted for unity gain using the RANGE setting selected in step 2. This procedure must be repeated if a different range setting is selected.

RELATIVE MEASUREMENTS

n making relative measurements, the front panel GAIN control may be varied to st the level of measurement at the desired level. To return the instrument to dition for obtaining absolute measurements, turn the GAIN control fully counter- kwise to the CALIBRATED (detent) position.

APPLICATIONS

SD-1012, when used with the SD-101, SD-101 Mark II, SD-101A or SD-1010, n extremely versatile and valuable instrument. Listed below are a few of its y applications. Contact Spectral Dynamics Corporation of San Diego or the representative in your area if additional application information is desired.

Sine Control and Monitoring in Swept Sine and Sine Random Tests--One channel servo control; one channel for plotting or monitoring transmissibility.

Multichannel averaging of the absolute values of accelerometer outputs for blishing average shaker table vibration level.

Mechanical Impedance--One channel for force; one channel for response.
e coherent filtered outputs applied to phase meter allow phase measurements
v frequency without meter or DC analog output "jitter".

Frequency Sweep Data--Often multichannel tape recordings are made of
nse data. Recording the excitation frequency on one tape track provides the
g signal allowing SD-1012's to be used during playback to remove signal noise
istortion.

Resonance Determination--By observing the filtered outputs on a scope for
roper phase relationship between the input to the specimen and the specimen's
nse.

Multichannel Power Spectral Density Analysis--Simultaneous plotting of
channel data allowing more rapid analysis of multiple pickup locations.

SECTION III

MAINTENANCE

GENERAL

r maintenance purposes, the various assemblies, major circuits and adjust-nts of the SD-1012 Tracking Filter are described and located in this section. len viewing the bottom of the unit, from the front, it is seen that the it is com-ed of four distinct assemblies (Figure 6). The low frequency assembly for nnel 1 on the right, contains the input signal amplifier, the filtered signal put amplifier and filter, the demodulator, and the main modulator with its ociated circuitry. In the center of the unit and toward the front, the high quency assembly contains the calibration circuit, the crystal filter circuitry, demodulator driver, and the 100 KC I. F. strip for both channels. Located the left is the low frequency for Channel 2. It is identical to the low frequency tion for Channel 1. The fourth assembly, located in the center and to the r, is the power supply module. The top view of this assembly (Figure 5) ws the plate supply voltage level adjustment.

INTERNAL CALIBRATION

ply Voltage Adjustment

e plate supply voltage for the unit must be adjusted to 150 volts DC. The ustment is accessible from the top of the power supply module and should be asured between the positive and negative terminals in the bottom of the module.

SYSTEM GAIN

r purposes of calibration, it will be necessary to fix the gain of the low fre-ncy input amplifier of each channel at 100, using the following procedure:

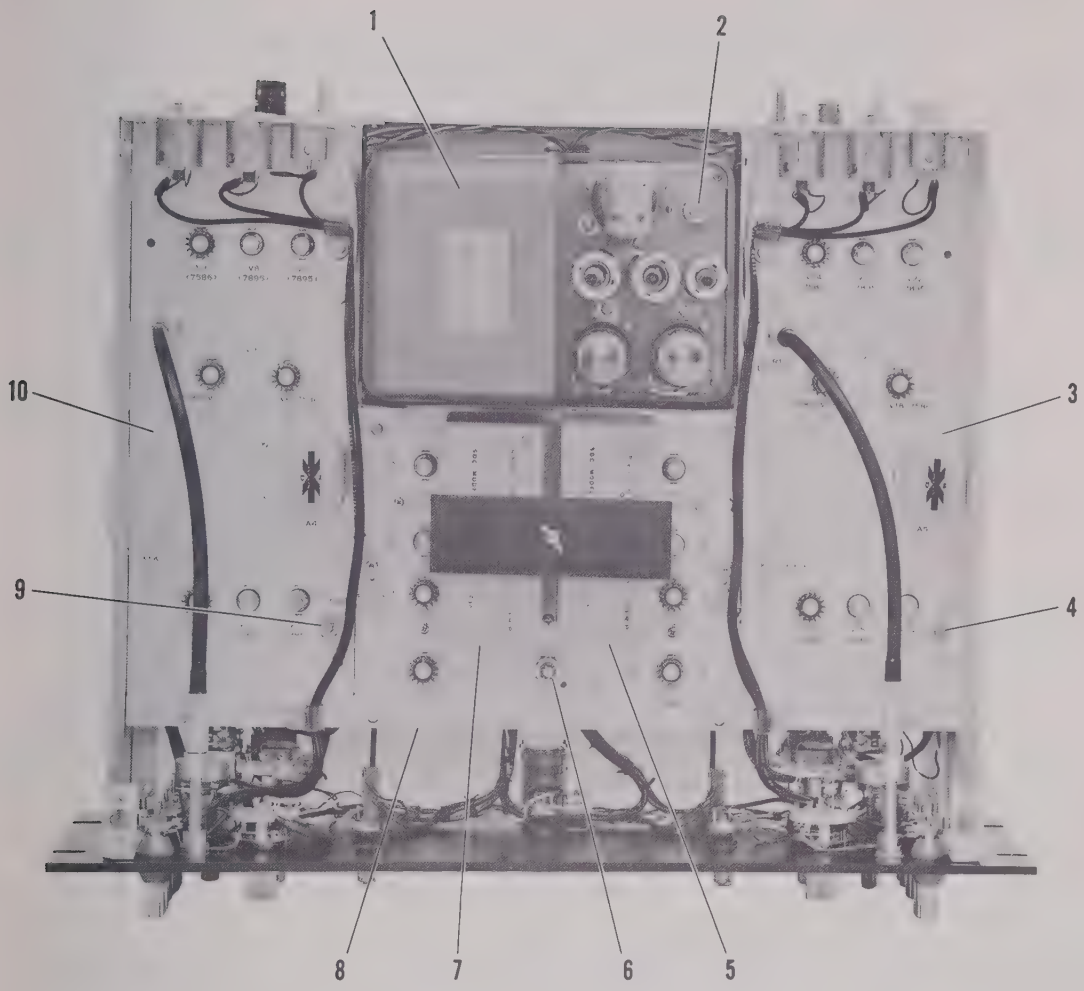
Set the RANGE switches to the 1. 0 volt position. Turn the GAIN controls ly counter-clockwise to the CALIBRATED (detent) position.

Apply 1. 0 volt (RMS), 100 cps signal to SIGNAL INPUT terminals of both annels.

Measure the signal amplitude at test point 1 (TP1) for Channel 1 and at t point 2 (TP2) for Channel 2. These test points are the rearmost ends of large 4. 0 MFD yellow capacitors found near the front of each channel. See gure 6.

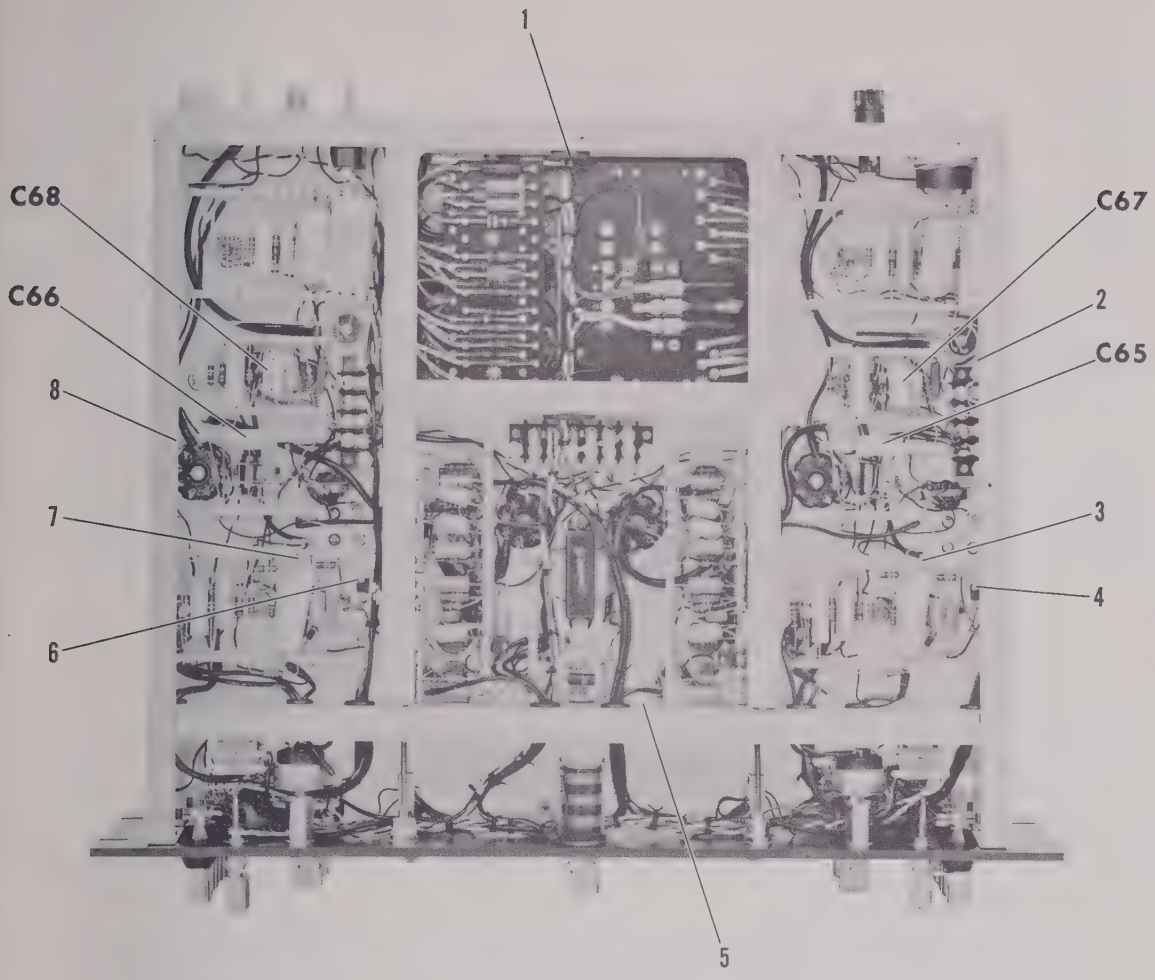
Adjust potentiometers R155 and R157 (Figure 5) for a reading of 10 volts MS) at TP1 and TP2.

Calibration is complete.



1 POWER SUPPLY MODULE (A3)
2 B-PLUS LEVEL ADJUSTMENT (R17)
3 LOW FREQUENCY CIRCUIT PLATE (CHANNEL 2)
4 GAIN-CALIBRATION ADJUSTMENT (R157)
5 BANDPASS FILTER (CHANNEL 2)
6 CAL CIRCUIT ADJUSTMENT (R66)
7 BANDPASS FILTER (CHANNEL 1)
8 HIGH FREQUENCY CIRCUIT PLATE (COMMON)
9 GAIN-CALIBRATION ADJUSTMENT (R155)
10 LOW FREQUENCY CIRCUIT PLATE (CHANNEL 1)

Figure 5. Top View



1 POWER SUPPLY MODULE (A3)
2 LOW FREQUENCY CIRCUIT PLATE (CHANNEL 1)
3 TEST POINT 1 (CHANNEL 1)
4 OVERLOAD INDICATOR LEVEL ADJUSTMENT (R28)
5 HIGH FREQUENCY CIRCUIT PLATE (COMMON)
6 OVERLOAD INDICATOR LEVEL ADJUSTMENT (R100)
7 TEST POINT 2 (CHANNEL 2)
8 LOW FREQUENCY CIRCUIT PLATE (CHANNEL 2)

Figure 6. Bottom View

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3-4 FILTER CAL ADJUSTMENT

Insertion loss of the plug-in crystal filters varies from unit to unit, and must therefore be normalized upon installation in the tracking filter. These adjustments are located on the front panel above the PHASE ADJ controls. Follow the procedure outlined below:

a. Connect the CARRIER SIDEBAND output of the SD1010 Carrier Generator or SD101 Mark II or SD101A Dynamic Analyzer to the CARRIER SIDEBAND inputs of both channels of the SD1012.

b. Turn both units to ON after allowing the equipment to warm up for approximately 45 minutes in the STBY position.

c. Check for correct input amplifier gain (see paragraph 3-3).

d. Connect Master Cal Cable between the SD1010 and SD1012 and switch the SD1010 to CAL. If an SD101, SD101 Mark II or SD101A is being used as a carrier source for the SD1012, both the SD101 models and the SD1012 must be placed in the CAL mode.

e. Set FILTER Selector to the IN position.

f. Set FILTERED OUTPUT adjustment fully clockwise.

g. While monitoring the FILTERED OUTPUT rotate the FREQ adjustment on the SD101, SD101 Mark II, SD101A or SD1010 for maximum output.

h. Rotate the PHASE ADJ potentiometer for a null as monitored at the FILTERED OUTPUT.

i. Adjust the FILTER CAL potentiometer for 7 volts rms output. This procedure should be repeated each time a different filter is installed.

j. Repeat above procedure for other channel.

k. Refer to paragraph 2-1 for routine operating procedure.

3-5 CALIBRATION OF INTERNAL REFERENCE

This procedure is very much the same as that set down in paragraph 3-3 for normalization of the filters. It differs in that an external signal source is required to drive the tracking filters and the carrier generator simultaneously. The amplitude of the signal drive level must be known very accurately.

a. Connect the tracking filter to an SD1010 Carrier Generator or SD101, SD101 Mark II or SD101A Dynamic Analyzer at the appropriate terminals.

b. Turn both units to ON after allowing approximately 45 minutes warmup in STBY.

c. Check for correct input amplifier gain (see paragraph 3-3).

d. With a common signal source connected to the tracking filters and the carrier generator, adjust the input signal level for exactly 1 volt rms.

e. Rotate the FILTER OUTPUT level adjustment fully clockwise for each channel.

f. The output signal levels should measure exactly 10 volts rms. If not, adjust the FILTER CAL potentiometers to obtain this level.

g. The tracking filter system is now accurately calibrated. Turn the MASTER CAL on the SD1010 to ON. If a SD101, SD101 Mark II or SD101A is used as a carrier source for the SD1012, turn both units to CAL.

h. The output signal levels should measure exactly 7 volts rms at this point. If necessary adjust the reference calibration level potentiometer R66 (Figure 5).

3-6 OVERLOAD INDICATOR ADJUSTMENT

The overload indicator is intended to inform the operator when crest factors of 4 to 1 have been exceeded. Overload occurs at 80 volts peak-to-peak at the output of the input amplifier. It is adjusted as follows:

a. Provide a signal to the input of the SD1012.

b. Set the FILTER IN/OUT Selector to IN.

c. While monitoring TP1 or TP2, increase the signal input until 80 volts peak-to-peak is obtained at one of the above test points.

d. Adjust the potentiometer, located forward in the low frequency section of the corresponding channel, until the indicator light just lights.

e. Repeat the above procedure for the other channel.

3-7 SIGNAL MODULATOR BALANCE

Trimmer capacitors C67 and C68 (Figure 6) are used to adjust the channels 1 and 2 signal modulators for minimum carrier feedthrough under no-signal conditions.

a. Short SIGNAL INPUT terminals. Turn FILTERED OUTPUT control fully clockwise (maximum amplitude).

b. Install 5, 10 or 20 cps crystal bandpass filter in channel to be adjusted. Warm up SD1012 and carrier source for 45 minutes.

c. Apply 2 cps tuning signal to carrier source. Monitor FILTERED OUTPUT voltage with an oscilloscope or true rms meter.

d. Adjust C67 (or C68) for minimum voltage reading.

e. Signal modulator balance is completed. Proceed to demodulator balance contained in paragraph 3-8.

3-8 DEMODULATOR BALANCE

Trimmer capacitors C65 and C66 (Figure 6) are used to adjust the channels 1 and 2 demodulators for minimum carrier feedthrough under no-signal conditions.

a. Peform steps a through d, paragraph 3-7.

b. Change tuning signal frequency to 100 cps.

c. Adjust C65 (or C66) for minimum FILTERED OUTPUT voltage reading.

d. Adjustment is complete.

3-9 TROUBLESHOOTING PROCEDURE

TROUBLE INDICATION	PROBABLE CAUSE AND REMEDY
Signal input, carrier sideband input but not output from filter of one channel.	V1 of channel one or V18 of channel two defective. Replace defective tube. Check filter output at pin 6 on octal socket.
Normal signal level at filter signal output but no DC level one one channel.	V12 of channel one or V21 of channel two defective. Replace defective tube.
Normal dc level but no filtered signal output on one channel.	V5, V7, V8 or V9 of channel one, or V17, V22, V23 or V24 of channel two defective. Replace defective tube.
100 kc signal available at output of crystal filter, but no dc level output and no filtered signal output of one channel.	V10 or V11 of channel one, or V19 or V20 of channel two defective. Replace defective tube.
Signal input, carrier sideband input but no dc level nor filtered signal level out of either channel.	Either the reference oscillator frequency is not aligned with the crystal filter frequency, or the tuning signal and signal input frequencies are different, or both conditions exist. Perform the steps setforth in paragraph 2-1.
Carrier Generator on CAL, Tracking Filter on CAL but no dc level nor filtered signal output on either channel.	Reference oscillator frequency not aligned to crystal frequency or reference calibration level adjustment turned to minimum position. Recalibrate in accordance with instructions setforth in paragraph 3-5.
Overload indicators operate below normal signal levels (40 volts peak).	Overload adjustment setting has been disturbed. Recalibrate in accordance with instructions setforth in paragraph 3-6.

SECTION IV

REPLACEABLE PARTS

4-1 GENERAL

Standard components have been used in this instrument, whenever possible. Special components may be obtained direct from the factory. Orders for components should include a complete description of the part, along with model and serial numbers of the instrument.

Table 4-1 lists the replaceable components, complete with reference designation, of the special components in the unit that must be ordered directly from Spectral Dynamics Corporation of San Diego to ensure complete compatability.

Table 4-1. Replaceable Parts

REFERENCE DESIGNATION	DESCRIPTION	PART NUMBER
A1 & A2	Filter,Band Pass	Order by Model No.
A3	Power Supply	10050-3
A4 & A5	Filter, Low Pass	20013-012
A6 & A7	Demodulator	20013-013
CR7 & CR8 CR17 & CR18	Diode, Matched Pair (CD6112)	20013-107
T1 thru T3, T5 thru T8, T10	Transformer	20013-059
T9 & T11	Transformer	20013-117
T4	Transformer	TRIAD F-13X

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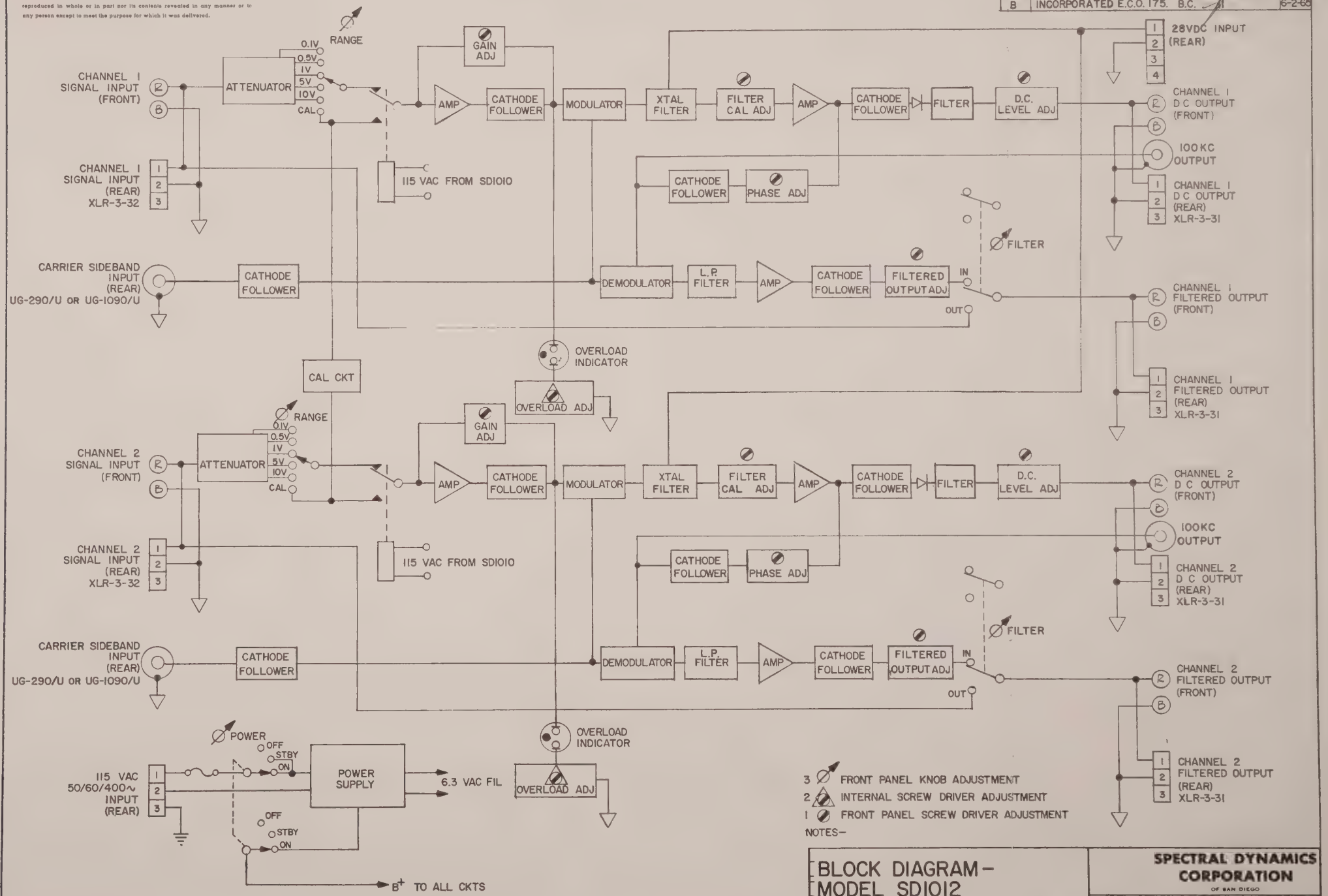
REVISIONS		
LTR	DESCRIPTION	DATE
A	INCORPORATED E.C.O. 075 AND 091	12-10-63
B	INCORPORATED E.C.O. 175. B.C.	6-2-65

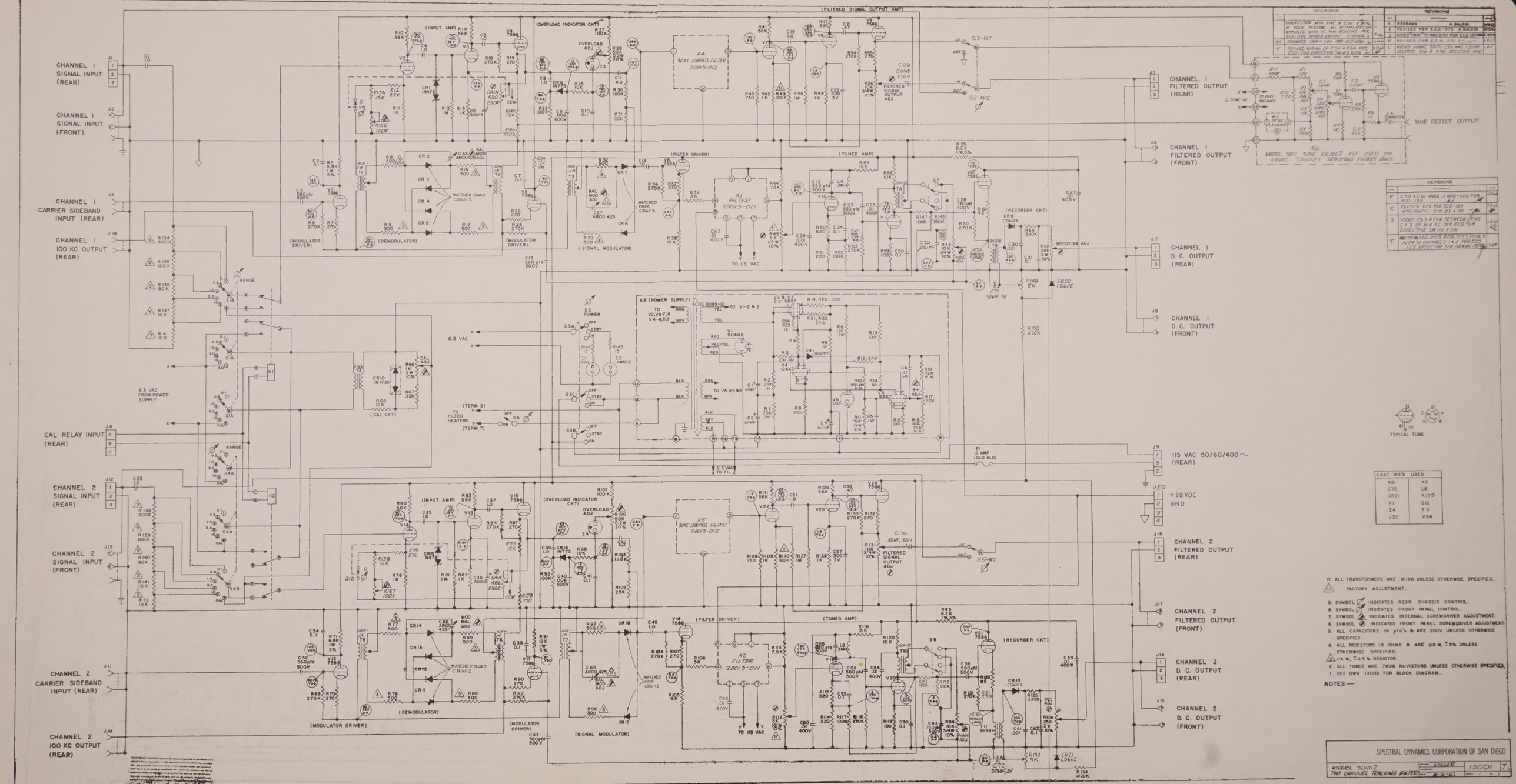


BLOCK DIAGRAM – MODEL SD1012 TRACKING FILTER

SPECTRAL DYNAMICS CORPORATION OF SAN DIEGO

C 13000 REV B

DRAWN G. MILLER | APPROVED L. LANCASTER | SHEET 1 OF 1 | CODE IDENT


CHANNEL 1 SIGNAL INPUT (REAR)
CHANNEL 1 SIGNAL INPUT (FRONT)
CHANNEL 1 CARRIER SIDEBAND INPUT (REAR)
CHANNEL 1 100 KC OUTPUT (REAR)
CAL RELAY INPUT (REAR)
CHANNEL 2 SIGNAL INPUT (REAR)
CHANNEL 2 SIGNAL INPUT (FRONT)
CHANNEL 2 CARRIER SIDEBAND INPUT (REAR)
CHANNEL 2 100 KC OUTPUT (REAR)
CHANNEL 1 FILTERED OUTPUT (REAR)
CHANNEL 1 FILTERED OUTPUT (FRONT)
SINE REJECT OUTPUT
CHANNEL 1 D. C. OUTPUT (REAR)
CHANNEL 1 D. C. OUTPUT (FRONT)
115 VAC 50/60/400 (REAR)
+28 VDC
GND
CHANNEL 2 FILTERED OUTPUT (REAR)
CHANNEL 2 FILTERED OUTPUT (FRONT)
CHANNEL 2 D. C. OUTPUT (REAR)
CHANNEL 2 D. C. OUTPUT (FRONT)
(FILTERED SIGNAL OUTPUT AMP)
(OVERLOAD INDICATOR CKT)
(INPUT AMP)
(MODULATOR DRIVER)
(DEMODULATOR)
(SIGNAL MODULATOR)
(FILTER DRIVER)
(TUNED AMP)
(RECORDER CKT)
(CAL CKT)
A3 (POWER SUPPLY) T1
A4 30KC LOWPASS FILTER 20013-012
A5 30KC LOWPASS FILTER 20013-012
A1 FILTER 20013-011
A2 FILTER 20013-011
A6 MODEL 5D11, SINE REJECT KIT USED ON MODEL 5D10I2-1 TRACKING FILTERS ONLY.
TYPICAL TUBE
SPECTRAL DYNAMICS CORPORATION OF SAN DIEGO
MODEL 5D10I2 TWO CHANNEL TRACKING FILTER
DRAWN WALLER
DATE 8-6-62
13001 T

REVISIONS			
LTR	DESCRIPTION	BY	DATE
H	REDRAWN	A. BALKIN	5-64
I	REVISED PER ECO-075.	A. BALKIN	5-64
J	ADDED "BOX" TO R43 & R10 PER ECO-091		6-64
K	REVISED PER E.C.O. 091		6-64
L	ADDED R68(1.5K, 5W) C70(.047 400 PF) ECO-092 EFFECTIVE SN 103 & ON		7-64

REVISIONS			
LTR	DESCRIPTION	BY	DATE
P	C30 & C61 WERE .1 MFD-CHG PER ECO-150		1-65
R	REVISED T/D PER ECO-164 EFFECTIVE: S/N 83 & ON		2-65
S	ADDED C63 & C64 BETWEEN PINS 2 & 3 OF A1 & A2 PER ECO 169 EFFECTIVE SN 103 & ON.		3-65
T	ADDED R68 (1.5K, 5W) C70 (.047 400 PF) R157 (0.68 Ω, 5W) & R158 TO CHANNELS 1 & 2 PER ECO 175 EFFECTIVE S/N 108 & ON		3-65

LAST NO'S USED	
A6	K2
C72	L8
CR21	R159
F1	S10
I4	T11
J20	V24

12. ALL TRANSFORMERS ARE 91198 UNLESS OTHERWISE SPECIFIED.
⚠ FACTORY ADJUSTMENT.
9. SYMBOL ⟋ INDICATES REAR CHASSIS CONTROL.
8. SYMBOL ⟋ INDICATES FRONT PANEL CONTROL.
7. SYMBOL ⚠ INDICATES INTERNAL SCREWDRIVER ADJUSTMENT.
6. SYMBOL ⚠ INDICATES FRONT PANEL SCREWDRIVER ADJUSTMENT.
5. ALL CAPACITORS IN μfd's & ARE 200V UNLESS OTHERWISE SPECIFIED.
4. ALL RESISTORS IN OHMS & ARE 1/2 W, ±5% UNLESS OTHERWISE SPECIFIED.
⚠ 1/4 W, ±0.5% RESISTOR.
2. ALL TUBES ARE 7895 NUVISTORS UNLESS OTHERWISE SPECIFIED.
1. SEE DWG 13000 FOR BLOCK DIAGRAM.

NOTES —

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F. T. MAINT. LAB